**SE 3368 – SOFT COMPUTING**

**Spring, 2023**

**ASSIGNMENT 3**

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**Department: Software Engineering**

**Given:** May 12, 2023 **Due:** May 21, 2023

You are given the necessary information about a perceptron. Your task is to write a Java code to construct this perceptron and its learning mechanism. Here are some important instructions for your assignment.

Instructions:

* You can use the Java classes and codes provided in class and uploaded to Moodle.
* Keep your coding simple.
* Train your **perceptron** (just a single neuron not a multilayer ANN) with
  + Hebbian learning
  + Perceptron learning
  + Delta learning

rules separately. That means, you need to write three different methods for these learning rules.

* Once you find the adjusted weights of each input (for each learning rule), fill the **Table 2** below.
* After finishing and running your code, and filling **Table 2** below put your **JAVA** **project (with all your codes)** and this **assignment file** (convert to **PDF file**) in a folder. Name this folder with this format: “A3\_Firstname\_Lastname” (e.g. A3\_Kazim\_Erdogdu). Zip your folder and upload it to “Assignment3” in Moodle.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **x1** | **x2** | **x3** | **x4** | **x5** | **x6** | **Target output (t)** |
| 10 | 2 | 5 | 1 | 4 | 6 | 0.9 |
| 1 | 0 | 9 | 4 | 10 | 8 | 1.0 |
| 8 | 5 | 2 | 6 | 0 | 4 | 0.6 |
| 7 | 6 | 3 | 2 | 1 | 10 | 1.0 |
| 3 | 4 | 7 | 0 | 5 | 3 | 1.0 |
| 4 | 1 | 6 | 8 | 6 | 0 | 0.7 |
| 2 | 3 | 8 | 5 | 8 | 9 | 1.0 |
| 1 | 3 | 3 | 9 | 0 | 5 | 0.6 |
| 10 | 7 | 5 | 3 | 1 | 6 | 0.9 |
| 9 | 8 | 1 | 10 | 2 | 0 | 0.1 |

**Table 1**

* Initial weights are wi = 0.2 for i ∈{1,2,3,4,5,6}
* Learning rate η = 0.5
* Activation function is sigmoid:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **w1** | **w2** | **w3** | **w4** | **w5** | **w6** |
| Hebbian Learning Rule | 40.30 | 27.6 | 43.49 | 30.39 | 33.1 | 46.4 |
| Perceptron Learning Rule | 32.85 | 21.79 | 40.64 | 21.49 | 31.05 | 44.00 |
| Delta Learning Rule | 31.38 | 20.65 | 40.08 | 19.75 | 30.64 | 43.52 |

**Table 2**

***NOTE:*** *Late submissions will get a* ***deduction*** *of* ***25 points per day****.*